



Spirodesma magdae* nov. gen. nov. sp. (Nematoda: Desmodoridae) from the Brazilian deep sea (Campos Basin, Rio de Janeiro, Brazil)

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Abstract

A new genus and species of Desmodoridae was found in deep-sea sediments of the Campos Basin. Although the cuticle annulation of the new species is similar to members of Desmodorinae, many morphological features are strong enough to classify it within the Spiriniinae. *Spirodesma magdae* nov. gen. nov. sp. is characterized mainly by the presence of a unique form of unispired amphids, with circular amphideal fovea, and a buccal cavity with three equal teeth, one dorsal and two ventrosublateral.

Key words: Spiriniinae, new genus, new species, marine taxonomy

Introduction

Free-living marine nematodes belonging to the family Desmodoridae Filipjev, 1922 have been reported from most deep-sea sediment assemblages, but always in small numbers, reaching at most 1% of total individuals (Soetaert & Heip 1995). In the Campos Basin, 185 genera were identified, and 10 of them (18.5%) belonged to the Desmodoridae. Of these, 4 (40%) were identified as members of the subfamily Spiriniinae: *Chromaspirinia* Filipjev, 1918, *Metachromadora* Filipjev, 1918, *Onyx* Cobb, 1891 and *Spirinia* Gerlach, 1963.

Desmodoridae are essentially marine nematodes, with few exceptions (Decraemer & Smol 2006). According to Lorenzen (1994) there is no autapomorphy for this family, and it is largely distinguished by not possessing the typical features of the families Epsilonematidae Steiner, 1927 and Draconematidae Filipjev, 1918, such as adhesion tubes or ambulatory setae. Within the Desmodoridae there are differences in thickness among the various regions of the body; the ovaries and the vulva lie well posterior to the middle of the body; and the cuticle has very coarse annules, at least in the anterior body region. Within this family there are six subfamilies, separated from each other by unique characters. Members of Prodesmodorinae Lorenzen, 1981 have almost exclusively parthenogenetic reproduction and the species are purely limno-terrestrial; members of Stilbonematinae Cobb, 1920 are obligatorily associated with bacterial epigrowth; Molgolaiminae Jensen, 1978 differ mainly in having round amphids; Desmodorinae Filipjev, 1922 have a globular head capsule; members of Pseusochinae Gerlach & Riemann, 1973 have the buccal cavity bilaterally symmetrical, large, tubular, subdivided, and with ventrosublateral teeth at the level of the junction; and members of Spiriniinae Gerlach & Murphy, 1965 have no head capsule and the buccal cavity is rather small, from minute to medium-sized (Lorenzen 1994).

The present report describes a new genus within one of these six subfamilies, Spiriniinae.

Material and Methods

Details about the material and methods (field and laboratory works) and about the study area are shown in Botelho *et al.* (2007).

Abbreviations used in the text:

abd: anal body diameter

amph: amphideal fovea diameter

amph%: percentage of amphideal fovea diameter in relation to head diameter

amphd pos: distance of amphideal fovea from anterior end

annul hd: distance between “annulations” in head region

annul hb: distance between “annulations” in the mid-body region

annul t: distance between “annulations” in tail region

bulb: pharyngeal bulb diameter

bulb %: pharyngeal bulb diameter as % of corresponding body diameter

cbd: corresponding body diameter

cs: cephalic setae length

gub: gubernaculum length

hd: head diameter

L: body length

mbd: body maximum diameter

ph: pharynx length

nr: position of nerve ring from anterior body end

som s: somatic setae length

subc. s.: sub-cephalic setae length

spic: spiculum length measured along the arc

t: tail length

v: vulva distance from anterior end

V: position of the vulva as percentage of body length from anterior end

a, b, c, c': ratio's of De Man (1880)

Body regions were named according to Coomans (1979)

All measurements are in micrometers.

Study material

Specimens: 4 males; 2 females; 2 juveniles.

Type material: The holotype (MNRJ 326) and the allotype (MNRJ 327) are deposited in the National Museum of Rio de Janeiro. Three male paratypes (NM LMZOO UFPE 116 a 118), 1 female paratype (119) and 2 juveniles (120 a 121) are deposited in the Meiofauna Laboratory of the Zoology Department, Universidade Federal de Pernambuco.

Type locality: Campos Basin (Rio de Janeiro, Brazil) deep-sea. The holotype was found in 1350 m depth (Figure 1). The specimen was found at 2–5 cm depth in the silt-clay sediment profile.

Other localities: the allotype was found in 1950 m depth while the male and female paratypes were found in 750 and 1050 m depth in silt-clay sediment, respectively. All these specimens were found at the profile 0–2 cm.

Measurements: see table 1

Etymology. The genus name refers to the presence of characters from both subfamilies Spiriniinae and

Desmodorinae. The specific epithet is in honor of Professor Dr. Magda Vincx from Ghent University, Belgium.

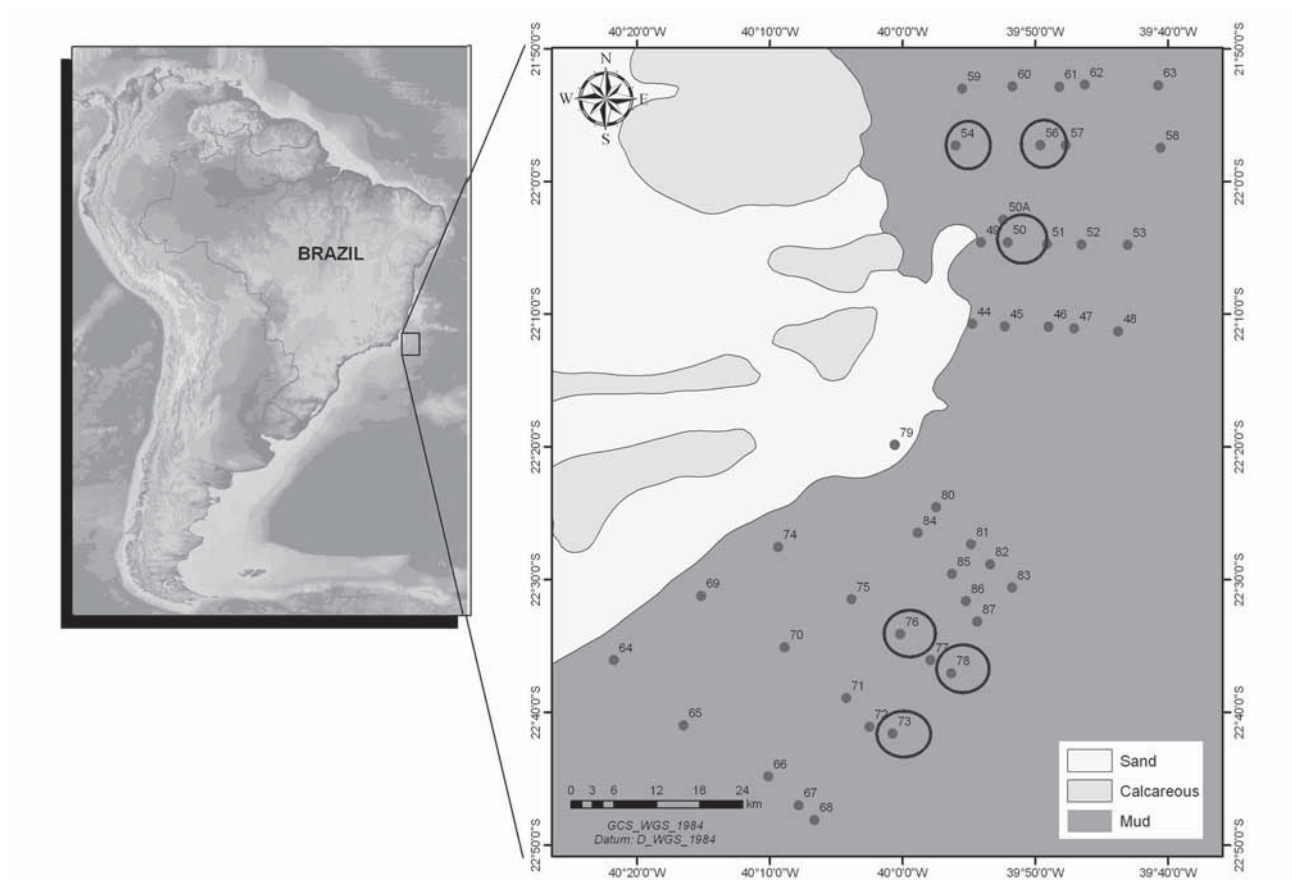


FIGURE 1. Study area with the station locations circled where *Spirodesma magdae* nov. gen. nov. sp. specimens were found.

Taxonomy (after Decraemer & Smol 2006)

Desmodora De Coninck, 1965

Desmodorina De Coninck, 1965

Desmodoroidea Filipjev, 1922

Desmodoridae Filipjev, 1922

Spiriniinae Gerlach & Murphy, 1965

Diagnosis of the subfamily Spiriniinae (after Decraemer & Smol 2006). Desmodoridae. Body cuticle finely striated. Head not demarcated as a cephalic capsule. Amphideal fovea a simple spiral, usually located far anterior on the body. Buccal cavity rather small, from minute to medium-sized, with a distinct or a minute dorsal tooth; two smaller ventrosublateral teeth may be present or absent.

List of valid genera within Spiriniinae (Lorenzen 1994; Verschelde, Muthumbi & Vincx 1995; Vincx & Goubault 1989):

Alaimonema Cobb, 1920

Chromaspirina Filipjev, 1918

Metachromadora Filipjev, 1918

Onyx Cobb, 1891
Papillonema Verschelde, Muthumbi & Vincx, 1995
Parallelocoilas Boucher, 1975
Perspiria Wieser & Hopper, 1967
Polysigma Cobb, 1920
Pseudometachromadora Timm, 1952
Sigmophoranema Hope & Murphy, 1972
Spirinia Gerlach, 1963 (type genus)

TABLE 1. Morphometrical characteristics (in μm) of *Spirodesma magdae* nov. gen. nov. sp. n.v. = not visualized, n.a. = not applied.

	Hollotype	P 99	P100	P101	Allotype	P102	P103	P104
L	765	811	995	857	903	594	588	636
hd	13	14	18	22	16	15	15	14
amph pos	5	4	6	n.v.	4	4	4	3
amph	7	8	n.v.	n.v.	7	7	9	8
%cbd	55%	57%	n.v.	n.v.	48%	44%	60%	61%
mbd	28	42	52	46	39	33	36	30
abd	23	29	30	31	27	18	25.8	21
ph	101	104	102	102	99	94	97	95
nr	66	60	n.v.	n.v.	53	44	49	48
% nr	65	58	n.v.	n.v.	53	47	50	50
bulb	23	29	20	27	26	20	22	24
cbd	31	41	39	35	41	30	30	32
%cbd	75	70	50	76	63	66	74	75
spic	34	39	40	32	n.a.	n.a.	n.a.	n.a.
gubern	16	19	17	18	n.a.	n.a.	n.a.	n.a.
t	77	75	87	77	71	72	62	74
v	n.a.	n.a.	n.a.	n.a.	383	297	n.a.	n.a.
V %	n.a.	n.a.	n.a.	n.a.	42	50	n.a.	n.a.
amph turn	2	2	n.v.	n.v.	2	1	1	1
a	27	19	19	19	23	18	16	21
b	8	8	10	8	9	6	6	7
c	10	11	11	11	13	8	10	9
c'	3	3	3	3	3	4	2	4
annul.head	1	1	1	1	1	1	1	1
annul.tail	1	2	2	1	1	1	1	2
annul hb	2	1	2	2	2	1	1	2

Diagnosis of Spirodesma nov. gen. Body tapering at extremities. Body cuticle with strong transverse annulations. Amphids unispired, with circular amphideal fovea. Buccal cavity with 3 equally sized teeth. Pharynx with well-developed spherical and terminal esophageal bulb. One anterior testis lying left of intestine in male; two opposed reflexed ovaries in female. Spicules ventrally curved, capitulum not offset and velum well developed. Three tubular precloacal supplements. Conico-cylindrical tail. Three caudal glands ending in a spinneret.

Type species: Spirodesma magdae nov. gen. nov. sp.

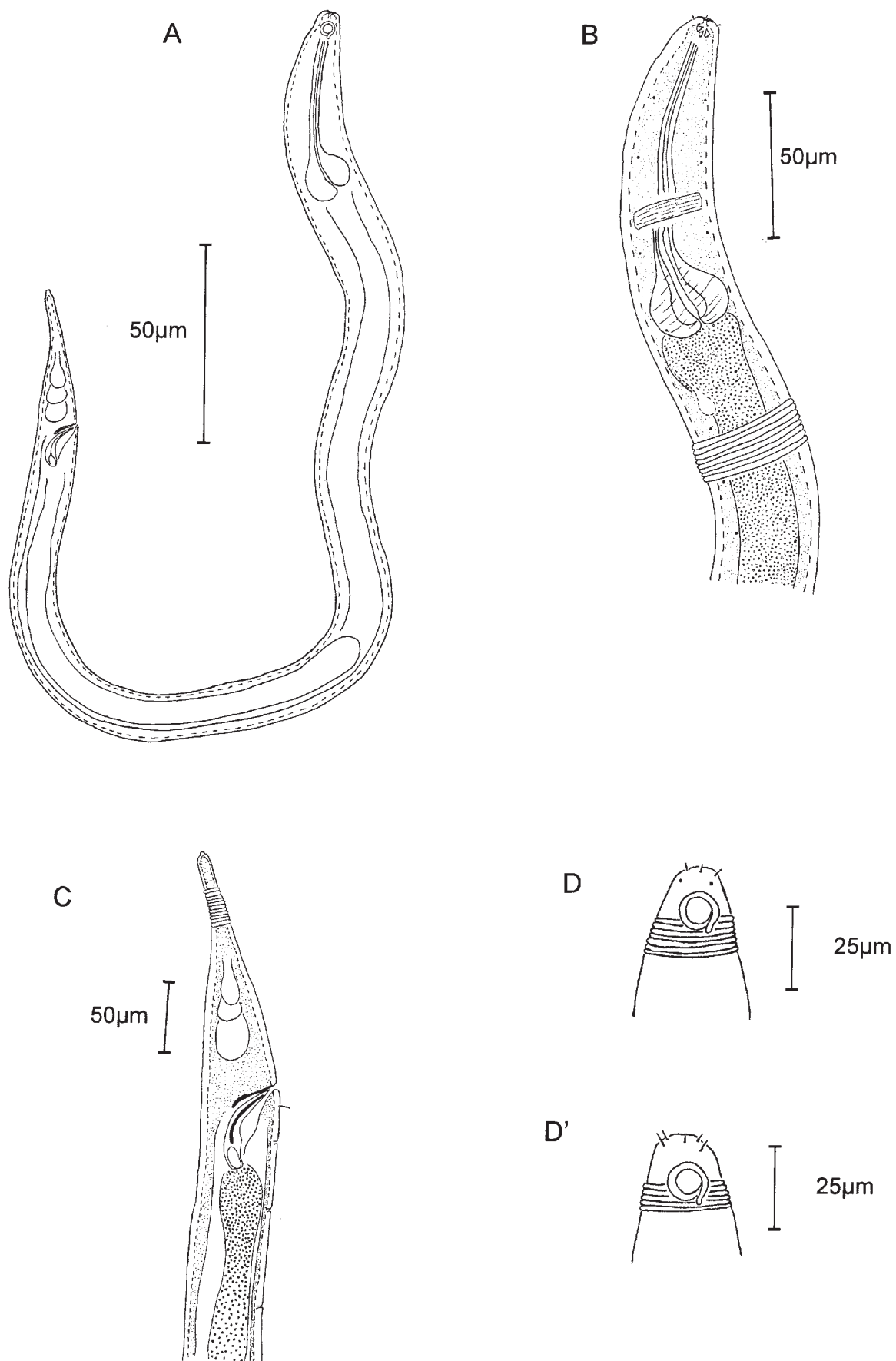


FIGURE 2. Male: A, entire body; B, teeth, bulb, nerv ring, secretory-excretory gland; C, tail, caudal glands, spinneret, supplements, spicules, gubernaculum, velum and precloacal setae; D, papillae arrangement in the male, cuticle annulation and amphid; D', papillae arrangement in juvenil. Scales: A, B, C = 50 µm and D, D' = 25 µm.

Description. Holotype (Figures 2 and 4): Cylindrical body, tapered towards both extremities. Cuticle with transverse annulations, less obvious in head (1 µm width) than in tail (2 µm width) region. Head not set off as distinct capsule. Anterior sensilla arrangement 6+6+4. Cephalic sensilla papilliform. Amphids unispired with circular amphideal fovea, turned ventrally, half surrounded by annulations, and 5 µm from anterior end. Sub-cephalic setae not present. Somatic papillae arranged symmetrically and in pairs laterally along the body. Buccal cavity with 3 equal teeth, 1 dorsal and 2 ventrosublateral. Pharynx muscular, with well-developed spherical and terminal esophageal bulb, occupying 75% of corresponding body width, its lumen wall strongly cuticularized and musculature with median protoplasmatic interruption. Nerve ring at 65% of total pharynx length from anterior end. Secretory-excretory pore not observed. Excretory gland 134 µm from anterior end. One anterior testis lying left of intestine. Spicules ventrally curved, capitulum not offset, and velum well developed. Gubernaculum without apophysis. Three tubular precloacal supplements present, anterior most papilla 33 µm distant from second papilla, and second papilla 22 µm distant from posterior most papilla; this papilla located 18 µm anterior to cloacal opening. Postcloacal setae present. Conico-cylindrical tail. Three caudal glands ending in a spinneret.

Allotype (Figures 3 and 4): Female quite similar to male, apart from minor morphometrical differences (Table 1) in the range of body lengths. Sexual dimorphism not observed. Two opposed reflexed ovaries present, and vulva at 42% distance from anterior end.

Paratype: Juvenile quite similar to adult, apart from minor morphological differences (Table 1), and the type of cephalic papillae, which are setiform (Figure 2).

TABLE 2. Different characters between *Spirodesma* nov. gen. and the other genera within the Spiriniinae.

Genus	Cuticle	Teeth	Amphid form	Esophageal bulb
Chromaspirina	annulated	dorsal and 2 small ventral teeth	spiral with circular outline	no bulb or pyriform bulb
Pseudometachromadora	annulated	large dorsal tooth and smaller ventral tooth	transversally oval in outline and cryptospiral	only weakly dilated posteriorly
<i>Spirodesma</i> nov. gen.	annulated	dorsal tooth and 2 ventrosublateral teeth (same size)	unispiral with circular fovea	well developed spherical and terminal
Onyx	finely striated	dorsal tooth	spiral	enlarges to a longish bulb
Papillonema	finely striated	large dorsal tooth, 2 minute subventral teeth	multispiral	elongate muscular terminal
Perspiria	finely striated	three minute teeth	spiral with circular outline	prominent round to pyriform terminal bulb
Spirinia	finely striated	no teeth or minute one or 1 dorsal tooth and 2	unispiral, circular out line	well developed spherical and terminal
Metachromadora	smooth striated	dorsal tooth	large and spiral	large, long bulb
Polysigma	smooth striated	not informed	unispiral	ovoid swelled
Alaimonema	striated	3 very small onchia	multispiral	pyriform
Sigmophoranema	striated	1 dorsal onchium	unispiral	not informed
Parallelocoidas	striated	1 dorsal tooth	unispiral	absent

Differential diagnosis: Table 2 lists the features of all genera belonging to the subfamily. The most similar genus to *Spirodesma* nov. gen. is *Chromaspirina*, but the new genus has strong characters distinct from this. *Spirodesma* nov. gen. and species of *Chromaspirina* have a rounded head, annulated cuticle, spiral amphideal fovea, and conical tail (Muthumbi *et al.* 1995). However, in *Chromaspirina* the buccal cavity is well developed, with a large, pointed, anteriorly-directed dorsal tooth and two smaller subventral teeth, no ventral gland, and spicules with a capitulum (Muthumbi *et al.* 1995); whereas *Spirodesma* nov. gen. has a small

buccal cavity with 3 teeth (equally sized), 1 dorsal and 2 ventrosublateral, ventral gland and capitulum not offset. Furthermore, most species of *Chromaspirina* either do not form a bulb or have a pyriform bulb (*C. cylindrocollis* Cobb, 1920; *C. parva* Ott, 1972; *C. lunatica* Gerlach, 1963), differing from *Spirodesma* nov. gen., which has a muscular pharynx with a well-developed spherical and terminal esophageal bulb.

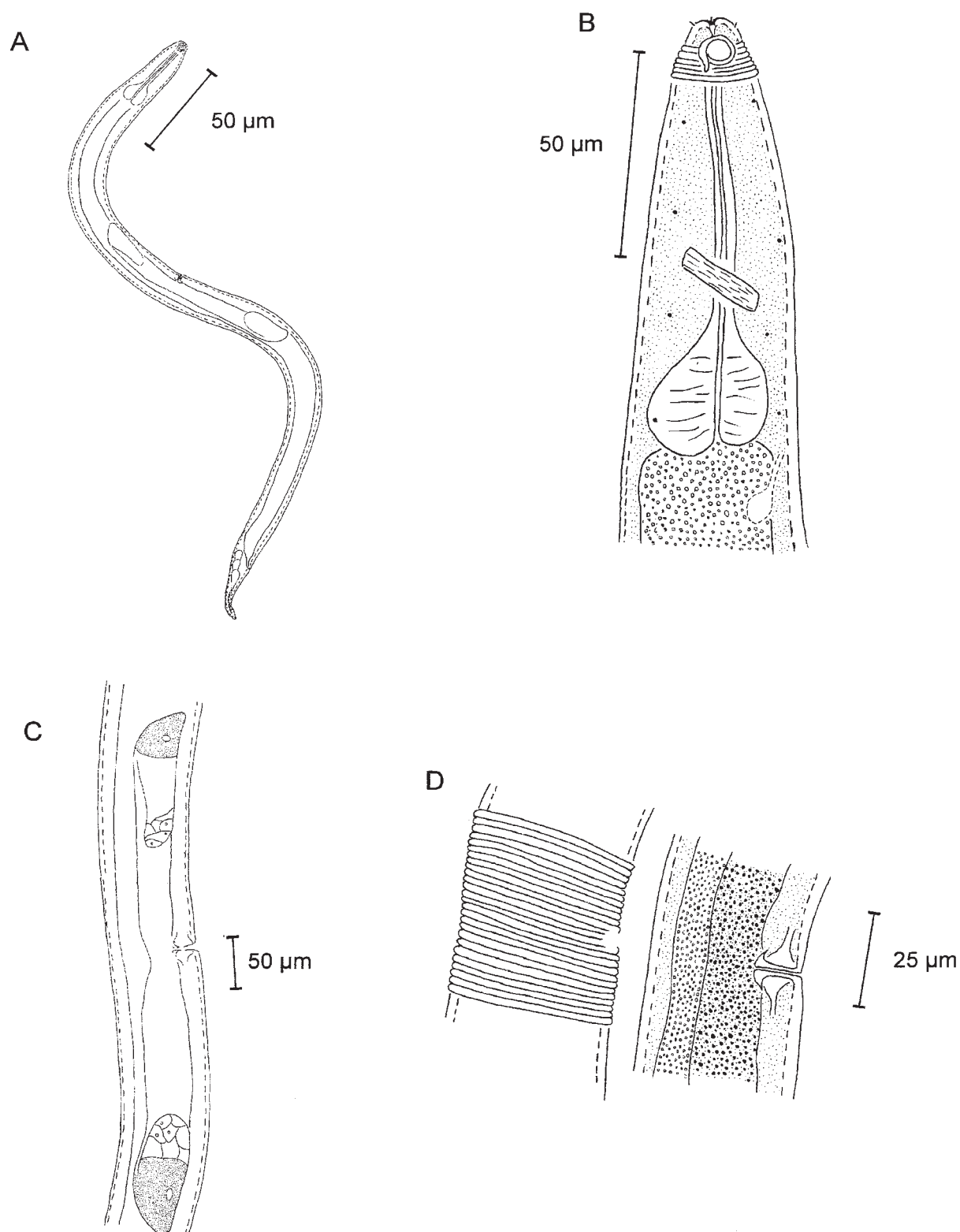


FIGURE 3. Female: A, entire body; B, bulb, nerve ring, secretory-excretory gland, cuticle annulation and amphid; C, reflexed ovaries; D, vulva and middle body annulation. Scales: A, B, C = 50 µm and D = 25 µm.

The cuticle, the size of the 3 teeth and the unique amphids shape distinguish *Spirodesma magdae* nov. gen. nov. sp. as a new genus and species within Spiriniinae. The presence of these 3, similarly sized, teeth make it necessary to emend the diagnosis of Spiriniinae.

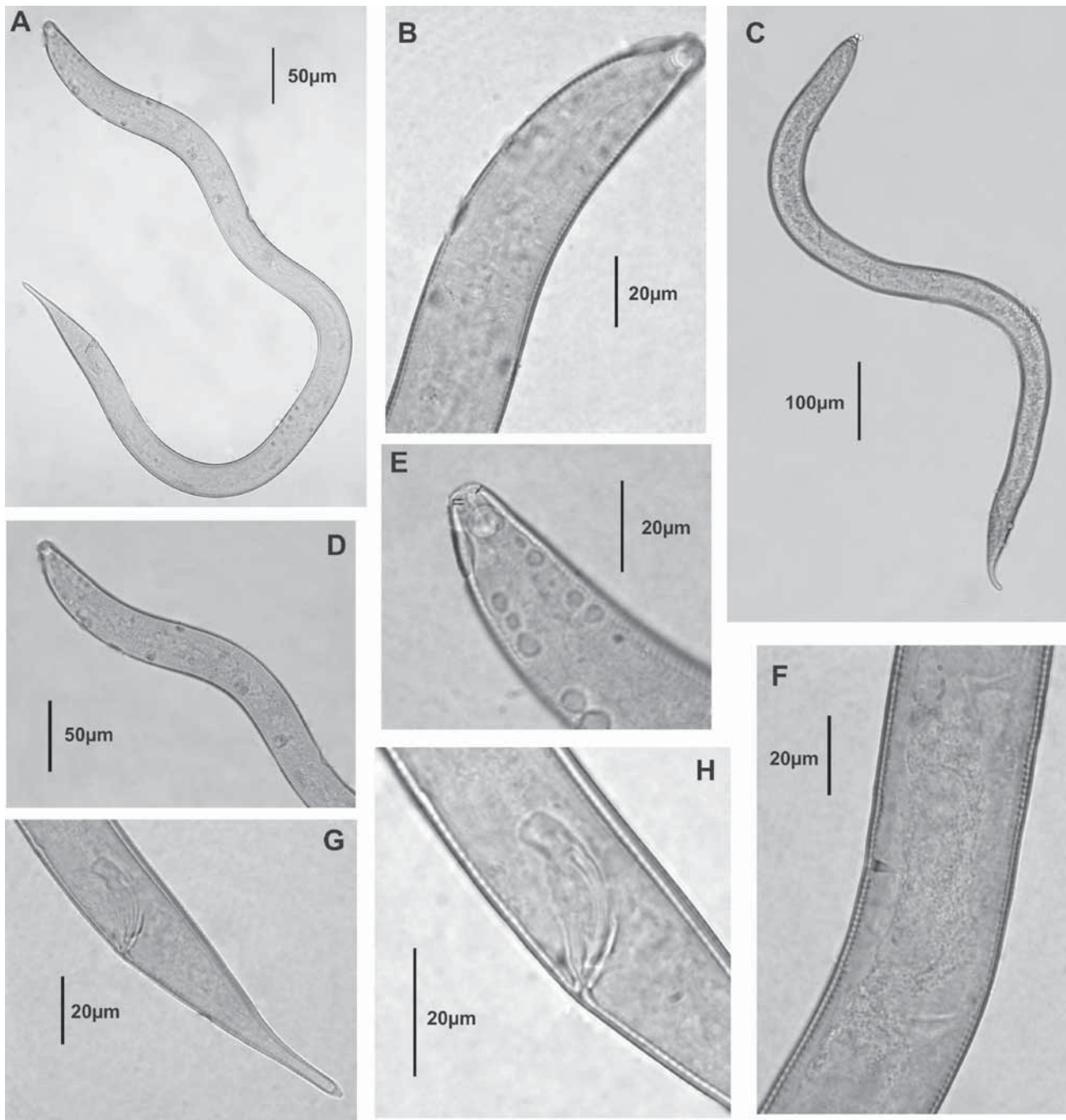


FIGURE 4. Male: A, entire body, B, bulb, D, body annulation, E, teeth, G, tail, caudal glands and spinneret, H, spicules and gubernaculum. Female: C, entire body, F, vulva and reflexed ovaries. Scales: A, D: 50µm; B, E, F, G and H: 20µm; C: 100µm.

Emended diagnosis of the subfamily Spiriniinae Gerlach & Murphy, 1965

Body cuticle finely or sometimes coarsely striated. Head not demarcated as a cephalic capsule. Amphideal fovea a simple spiral, usually located far anterior on the body. Buccal cavity rather small, from

minute to medium-sized, with a distinct or a minute dorsal tooth; 2 smaller ventrosublateral teeth may be present or absent; or 3 teeth of the same size.

Discussion

The cuticle of *Spirodesma* nov. gen., with strong annulations, greatly resembles members of the Desmodorinae. In contrast to the Brazilian new genus, the genera within Desmodorinae have a head set off as a conspicuous cephalic capsule or helmet, and the amphideal fovea in general, is not surrounded by striations and may be located on a cuticularized plate (Decraemer & Smol 2006).

Four genera within the Desmodorinae also do not have a head capsule (*Paradesmodora* Schuurmans Stekhoven, 1950, *Metadesmodora* Schuurmans Stekhoven, 1942, *Echinodesmodora* Blome, 1982, and *Stygodesmodora* Blome, 1982). Those genera have features strong enough to distinguish them from *Spirodesma* nov. gen. In *Paradesmodora* the amphids are large and cryptospiral and the cephalic setae are longer than those in *Spirodesma* nov. gen.. Moreover, the amphids of *Metadesmodora* are composed of two concentric circular bands, situated on a disc-like plate, and its buccal cavity has no teeth. In *Echinodesmodora*, the amphids are cryptospiral and surrounded by transverse striation, although the positions of the teeth are similar to *Spirodesma* nov. gen., differing only in size. As in *Echinodesmodora*, *Stygodesmodora* has amphids surrounded by transverse striations, but the buccal cavity only possesses a large dorsal tooth and a small ventrosublateral tooth, which differs from the Brazilian genus.

Although the new genus *Spirodesma* shows a body cuticle similar to those in Desmodorinae, many strong characters make it possible to classify it within Spiriniinae, such as: the head not demarcated as a cephalic capsule; the amphideal fovea as a simple spiral, located anteriorly on the body; and a small buccal cavity.

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